

What is Claimed Is:

1. A fuel processing system for reforming a hydrocarbon fuel characterized by:  
a first vaporization zone for receiving a hydrocarbon fuel and combining it with air or water;

a reformer in fluid connection with and down stream of the first vaporization zone, which receives the hydrocarbon fuel combined with either air or water to reform the fuel to a reformat stream, which contains a hydrogen rich atmosphere;

a second vaporization zone in fluid connection with the reformer which is capable of receiving the reformat stream from the reformer;

a water inlet connected to the second vaporization zone capable of introducing water to the reformat stream; and

a filter in fluid connection with and down stream of the second vaporization zone, which is capable of preventing a substantial portion of any soot contained in the reformat stream from passing therethrough, wherein the system is adapted to oxidize any soot collected on the filter in the hydrogen atmosphere of the reformat stream.

2. The fuel processing system of claim 1 further characterized by being adapted to introduce water and air to the second vaporization zone to oxidize any soot accumulated on the filter in the hydrogen atmosphere of the reformat stream.

3. The fuel processing system of claim 1 further characterized by having an oxidizing catalyst downstream of the filter to reduce the amount of any oxygen in the reformat stream.

4. The fuel processing system of claim 1 further characterized by being adapted to detect soot accumulated on to the filter.

5. The fuel processing system of claim 4 wherein soot is detected on to the filter by a differential pressure gauge connected to the system for measuring the pressure of the reformat stream before and after the filter.

6. The fuel processing system of claim 4 wherein soot is detected on to the filter by determining the operational history of the reformer.

7. The fuel processing system of claim 1 further characterized by estimating the filter outlet temperature during the oxidation of the soot and controlling the temperature of the filter outlet gas by introducing water to the reformat stream passing through the filter.

8. The fuel processing system of claim 7 wherein the filter temperature outlet is estimated by a temperature sensor connected to the system to detect the temperature of the reformat stream in the third vaporization zone.

9. The fuel processing system of claim 1 further comprising a water gas shift (WGS) reactor down stream of the filter, a heat exchanger down stream of the WSG, and a preferential catalyst down stream of the heat exchanger.

10. A process for removing soot in a reformat stream that has been collected on a filter, the process comprising:

combining a hydrocarbon fuel with air to form a hydrocarbon fuel-air mixture;

reforming the mixture to a reformat stream, which contains a hydrogen rich atmosphere;

passing the reformat stream through a filter to collect any soot in the reformat stream on the filter; and

when a predetermined amount of soot has collected on the filter, introducing at least water to the reformat stream for a set period of time during the reforming of the hydrocarbon fuel in sufficient quantity to oxidize the soot collected on the filter.

11. The process of claim 10 further comprising introducing air with the water to the reformat stream to oxidize the collected components.

12. The process of claim 10 further comprising introducing water in excess of that needed to reform the fuel to the mixture when oxidizing the soot collected on the filter.

13. The process of claim 10 comprising, after passing the reformat through the filter, passing the reformat stream through an oxidizing catalyst downstream of the filter to reduce the amount of any oxygen in the reformat stream.

14. The process of claim 10 comprising estimating the predetermined amount of soot on the filter by calculating the time lag between forming the mixture and sufficient hydrogen in the reformat stream to power a fuel cell.

15. The process of claim 10 comprising estimating the predetermined amount of soot on the filter by determining the pressure loss across the filter.

16. The process of claim 10 further comprising determining the temperature of the reformat stream passing through the filter.

17. The process of claim 16 comprising introducing water to the reformat stream down stream of the filter when the temperature of the reformat stream reaches a predetermined value.